

# NASA TECH BRIEF

*Lewis Research Center*



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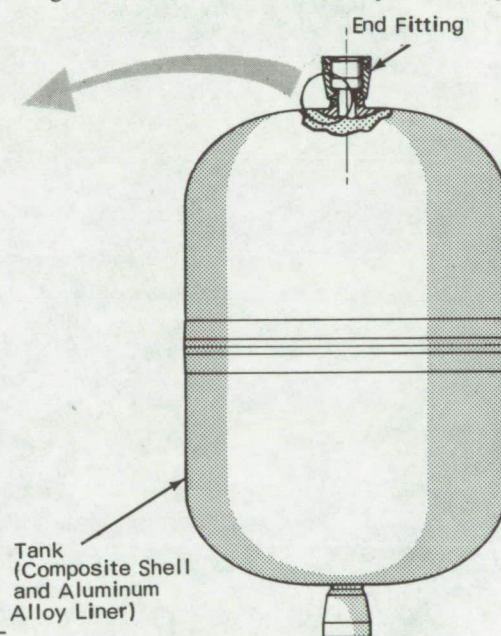
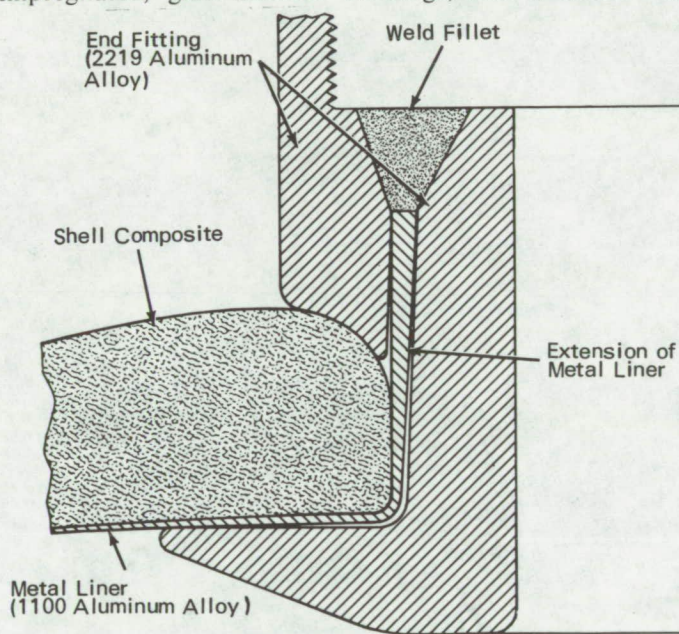
## Differential Expansion Fitting for Cryogenic Liquid Tanks

### The problem:

Lightweight tanks or pressure vessels used for cryogenic liquids consist of a shell made of plastic-impregnated, glass-filament windings, and a metal

### How it's done:

An extension of the aluminum alloy liner (slightly flared) is inserted into a two-piece aluminum alloy end-fitting or boss, and the three parts are joined



(aluminum alloy) liner. Because of the tank geometry and the different thermal expansion coefficients of the shell composite and the metal liner, the tank walls are subjected to severe stresses and strains as operating conditions vary. These stresses and strains are most severe at the end fittings conventionally used.

### The solution:

A sliding contact between the liner and the interior surface of the fitting accommodates the stresses and strains developed in the system.

with a fillet weld. As a result of this construction, the metal liner extension is hinged at the weld area with sufficient clearance to deform (expand or contract) along its unwelded surfaces, which are recessed in the fitting. Consequently, when the shell composite and metal liner deform as a unit, the stresses and strains are transmitted to that portion of the liner which is recessed in the fitting and which thus acts as a differential-expansion fitting.

(continued overleaf)

**Notes:**

1. The following documentation may be obtained from:

National Technical Information Service  
Springfield, Virginia 22151  
Single document price: \$3.00  
(or microfiche \$0.95)

**Reference:**

NASA-CR-72599 (N70-16724), Analysis of  
Filament-Wound Dome and Polar Boss of  
Metal-Lined Glass-Filament-Wound Pressure  
Vessels

2. Technical questions may be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B71-10268

**Patent status:**

No patent action is contemplated by NASA.

Source: R. E. Landes and E. E. Morris of  
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